CIMON PLC Function Block

- User Manual -

Version : 20150609

1. SPECIFICATION

1.1. Function Block Specification

Items			Description	Remark
Project	Max. registered FB		128	User Library
	Max. used FB		Up to CPU memory	
	Language		IL / LD	
FB	Name		Max. 32 characters	
	Password		Max. 16 characters	
	Password Hint		Max. 40 characters	
	Program Capacity		512 steps	
	Description		Max. 64 characters	
	Variable	Maximum Number	128	
			Input + I/O: 64 Output + I/O : 64 Local Variable : 896Word	Local Variable : Z Dev.
		Name	Max. 16 characters	
		Description	Max. 16 characters	
Version	CICON		Version 6.00 or higher	
	PLC CPU	Multiple FB	Version 6.00 or higher	Multiple FB used
		Single FB	All version	Only single FB used

• Unless it is Multiple FB, IO variable number will be limited up to 32.

1.2. Required CPU for Function Block (FB Type : Single / Multiple)

Series	CPU	FB	Multiple FB
CM1	XPnA	O	X
	XPnB	O	O
	CPnA~D	O	X
CM2	BP	O	X
CM3	PLCS	O	O
	Micro-S	O	O

• In order to use FB in CP series, CPU version must be 4.43 or higher.

• The multiple Function Blocks are supported in CPU firmware version 6.00 or higher version.

• Multiple FB **:** You can use multiple Function Blocks on one Rung.

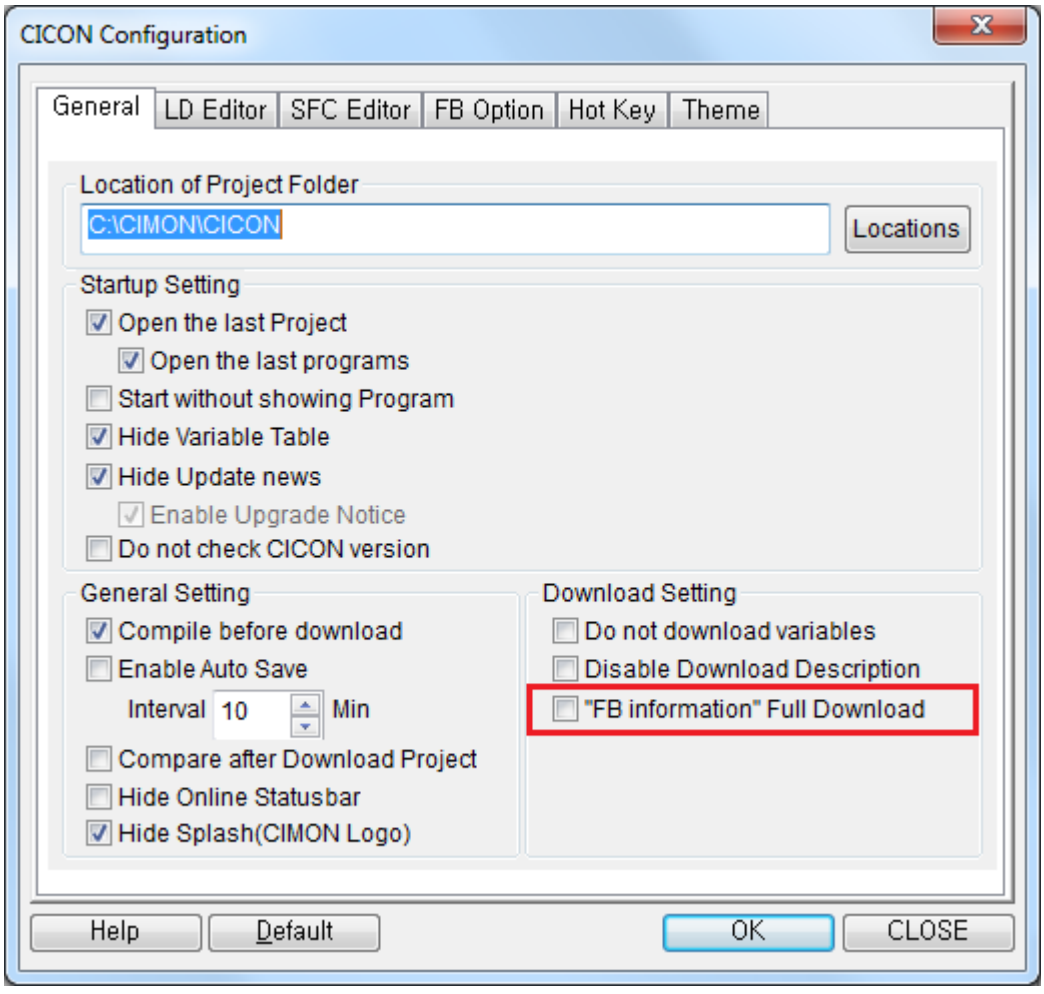
1.3. Size of Function Block

1.3.1 Function Block Download option

If you use Function Blocks in scan program, the size of project file will be increased according device, variable and description. The Function Block is added in project file when program is complied. Therefore, the step size of project file can be different with downloading steps into PLC.

In order to save PLC memory, “FB information” Full Download is disable in CICON Option menu. You may save 50%~80% size with this in general.

(If you want to download full information of FBs to CPU module, choose “FB information” Full Download.)



• In case of Full Download, below data will be downloaded to CPU module.

- ✓ Function Block information - Name / Password / Hint / Description
- ✓ Function Block Variable – Variable name / IO / Type / Device / Description
- ✓ Scan program for Function Block

- ✓ Etc. 2~3Step

• In case of NOT Full Download, below data will be downloaded to CPU module.

- ✓ Function Block information - Password
- ✓ Function Block Variable – IO / Type / Device
- ✓ Scan program for Function Block
- ✓ Etc. 2~3Step

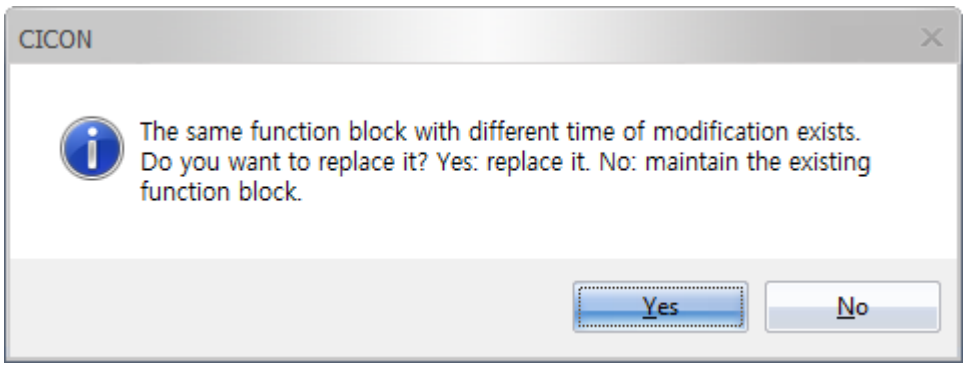
1.3.2 Function Block Upload

When you upload program from PLC to CICON, your opened project file in CICON has the same function blocks with uploaded function blocks. If not, uploaded function blocks will have different variable name and description.

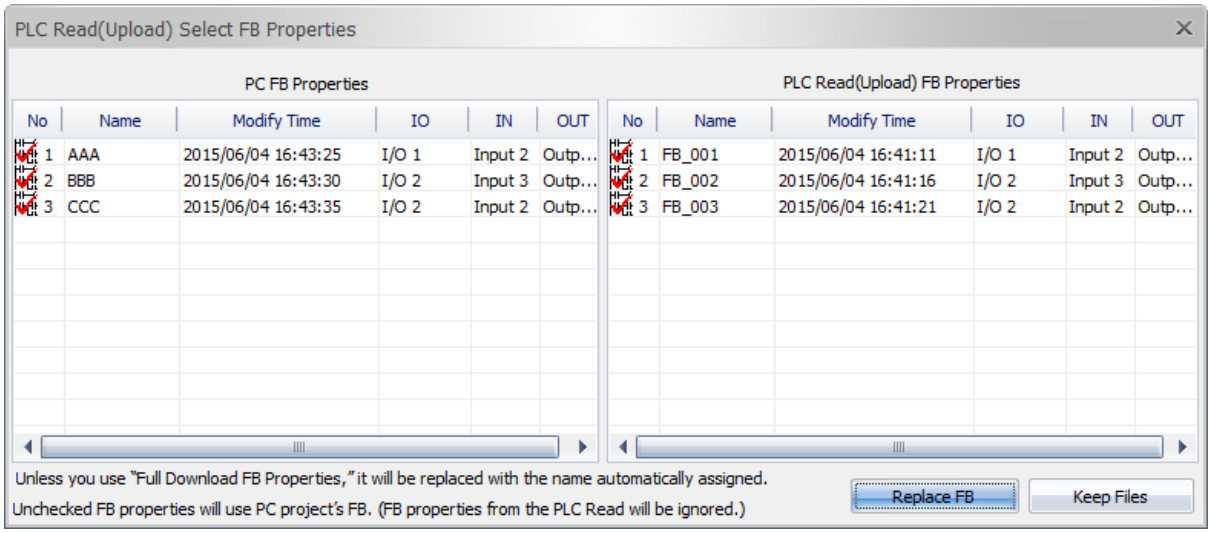
• If project file has the same FB with uploaded project.

- If time stamp is the same, the same function blocks are uploaded.

- If time stamp is different, you can overwrite uploaded function blocks to project file.

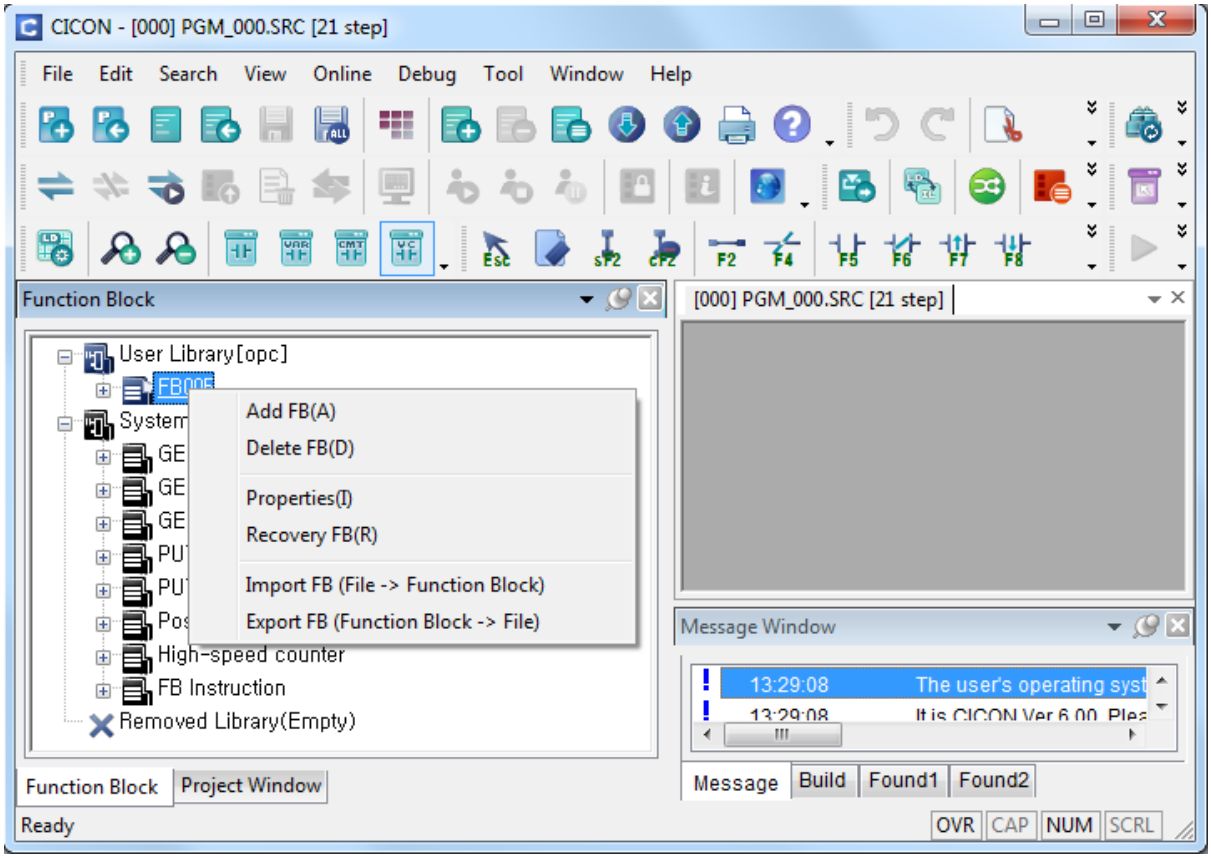

CICON
The same function block with different time of modification exists.
Do you want to replace it? Yes: replace it. No: maintain the existing function block.
Yes
No

If you click Yes, below Function Block list appears.


PLC Read(Upload) Select FB Properties
PC FB Properties
PLC Read(Upload) FB Properties
No Name Modify Time IO IN OUT
1 AAA 2015/06/04 16:43:25 I/O 1 Input 2 Outp...
2 BBB 2015/06/04 16:43:30 I/O 2 Input 3 Outp...
3 CCC 2015/06/04 16:43:35 I/O 2 Input 2 Outp...
1 FB_001 2015/06/04 16:41:11 I/O 1 Input 2 Outp...
2 FB_002 2015/06/04 16:41:16 I/O 2 Input 3 Outp...
3 FB_003 2015/06/04 16:41:21 I/O 2 Input 2 Outp...
Unless you use "Full Download FB Properties," it will be replaced with the name automatically assigned.
Unchecked FB properties will use PC project's FB. (FB properties from the PLC Read will be ignored.)
Replace FB
Keep Files

If you click Replace FB, uploaded Function Block will be used.

Even if you overwrite wrong function blocks, you can still recover it.



Right-click function block and choose Recovery FB(R) and choose the function block you want to recovery.

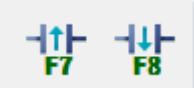
1.4. Function Block L Device

If you create Function Block, 16Word(256bit) is assigned to L device address automatically. Therefore, user cannot use those L address in other scan program.

Series	CPU	Input (64Bit)	Output (64Bit)	Monitoring
CM1	XP1A	L984.0 ~ L987.F	L988.0 ~ L991.F	L992.0 ~ L999.F
	XP2A			
	XP3A	L112.0 ~ L115.F	L116.0 ~ L119.F	L120.0 ~ L127.F
	CP3			
	CP4			
	XP1B	L984.0 ~ L987.F	L988.0 ~ L991.F	L992.0 ~ L999.F
	XP2B			
	XP3B			
CM2	BP	L48.0 ~ L51.F	L52.0 ~ L55.F	L56.0 ~ L63.F
CM3	PLCS	L240.0 ~ L243.F	L244.0 ~ L247.F	L248.0 ~ L255.F
	PLCS Block			

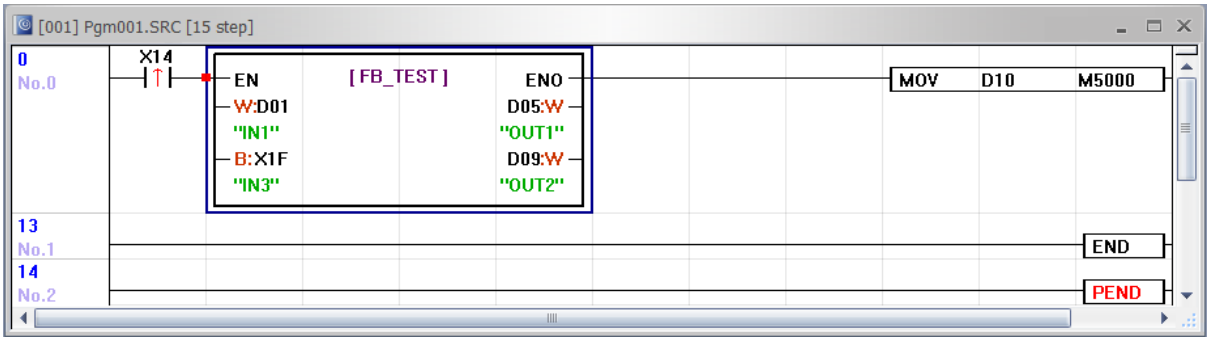
1.5. Limitation of Function Block Diagram in Use

1. Positive Transition-Sensing Contact and Negative Transition-Sensing Contact.



If you use both elements in Function Block repeatedly, FB may not recognize them.

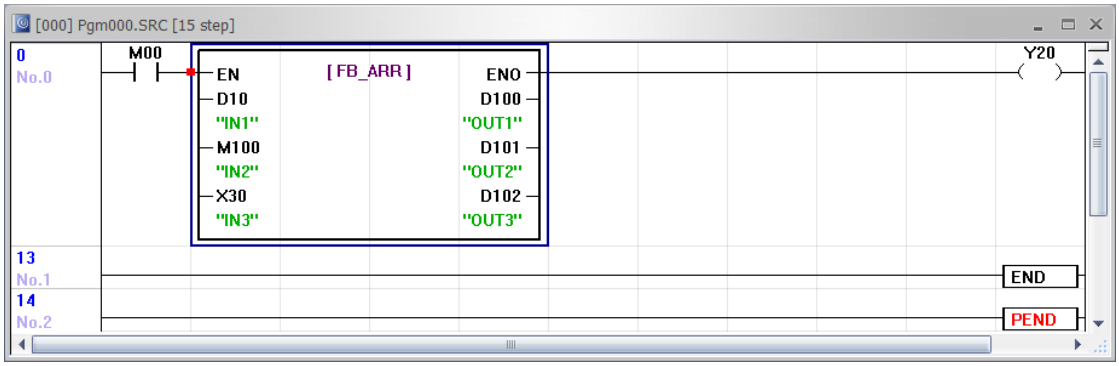
Instead of Positive and Negative Transition-sensing contact, use Normally Open Contact as below.

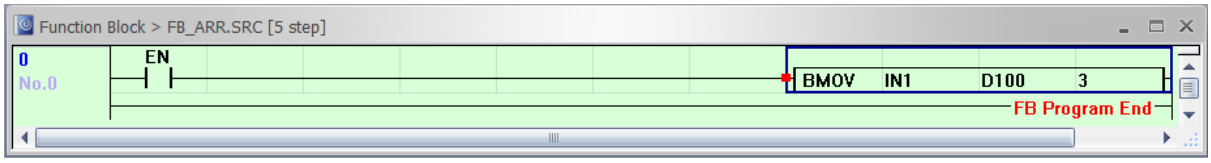


2. Array type instruction (Ex: BMOV, DSFR, FIFW and etc.)

The Input and Output variable in Function Block use device address in sequence.

Example)





If you use BMOV, you intend to send D10, D11 and D12 to D100, D101, and D102 in sequence. However, the result will show as below.

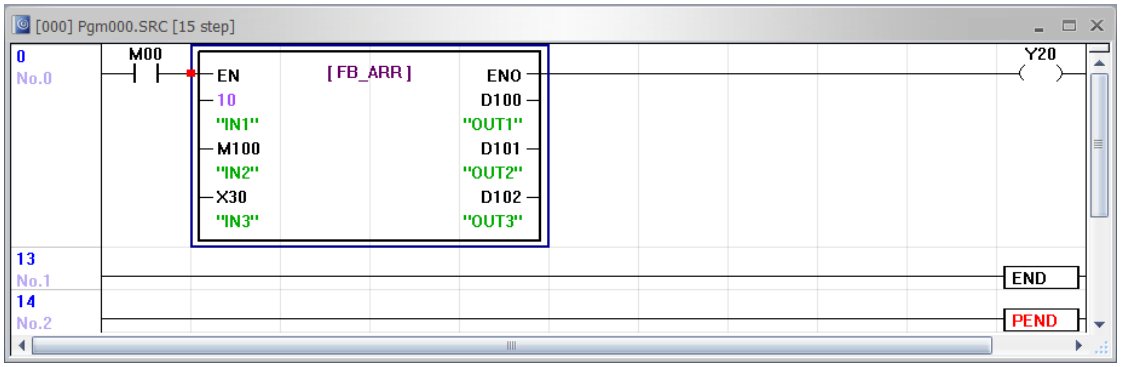
Input Var.	Device
IN1	10
IN2	M100
IN3	X30

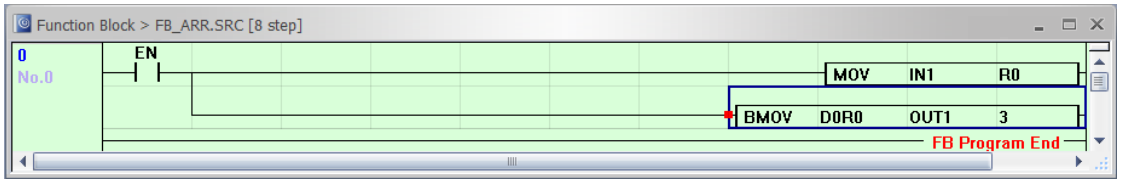
-->

Output Var.	Device
OUT1	D100
OUT2	D101
OUT3	D102

D10 moves to D100, M100 moves to D101, and X30 moves to D102.

In order to figure it out, use Index register as below.





Write Offset value 10 to IN1 (D device) and make it index register (R0) to have value in sequence.

Input Var.	Device		Output Var.	Device
IN1	D10	-->	OUT1	D100
IN2	D11	-->	OUT2	D101
IN3	D12	-->	OUT3	D102

CARD	0	1	2	3	4	5	6	7	8	9
D0000	0	0	0	0	0	0	0	0	0	0
D0001	8000	10000	16000	0	0	0	0	0	0	0
D0002	0	0	0	0	0	0	0	0	0	0
D0003	0	0	0	0	0	0	0	0	0	0
D0004	0	0	0	0	0	0	0	0	0	0
D0005	0	0	0	0	0	0	0	0	0	0
D0006	0	0	0	0	0	0	0	0	0	0
D0007	0	0	0	0	0	0	0	0	0	0
D0008	0	0	0	0	0	0	0	0	0	0
D0009	0	0	0	0	0	0	0	0	0	0
D0010	8000	10000	16000	0	0	0	0	0	0	0

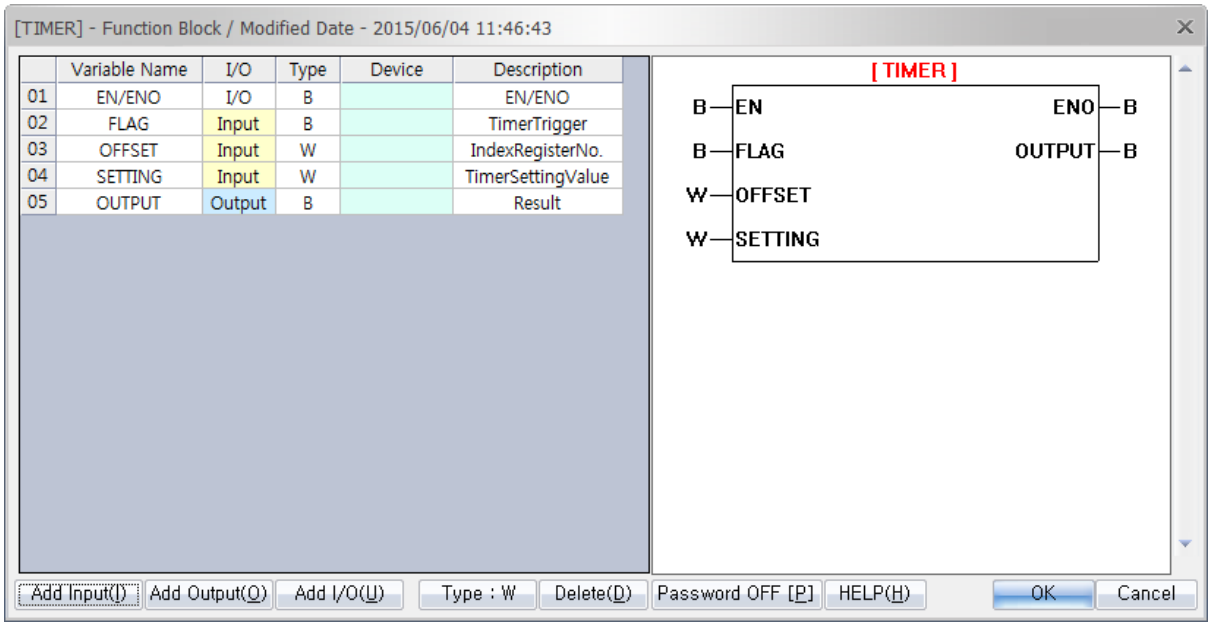
3. Timer and Counter

If you want to use Timer or Counter in Function Block Diagram, Index Register (Offset R device) must be used. Timer and Counter Instruction (TON, CTU and etc.) only use Timer and Counter device.

You can use Index register (R device) with below CPU type.

CPU Type	Firmware version
PLCS	Version 6.10
Micro-S	Version 6.10
XPnB	Version 6.10
XPnE	All version
CPnE	All version

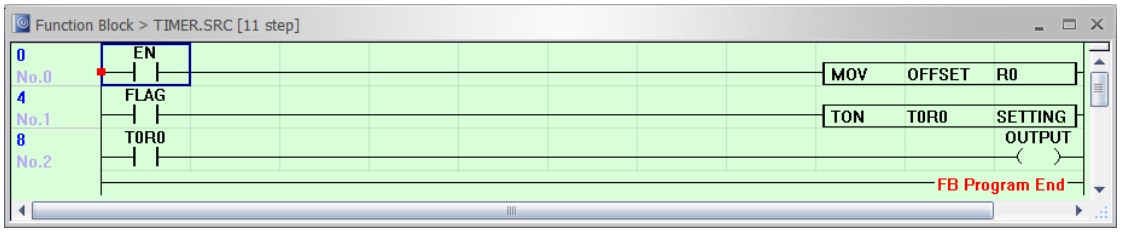
• TON (On Delay Timer) Instruction : Variable configuration



Variable Name	I/O	Type	Device
FLAG	Input	Bit	Operating bit for ON Delay Timer
OFFSET	Input	Word	Write Index register number (0~15)
SETTING	Input	Word	Write Timer set value (TS) (According to PLC parameter, 100ms / 10ms)
OUTPUT	Output	Bit	It will be turned ON, if FLAG bit is remained ON in Setting time.

- SETTING : If it is 100ms and you write 30, it will be 3second.

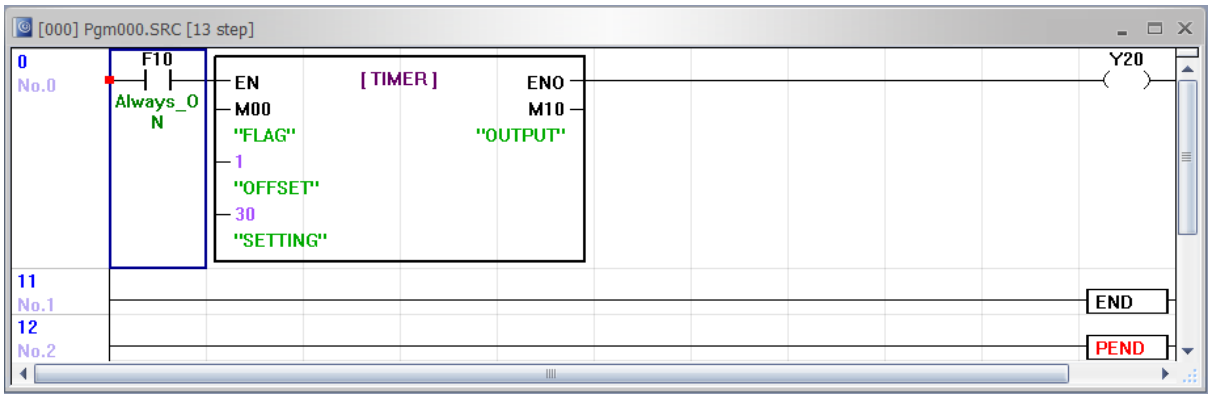
• TON (On Delay Timer) Instruction : Function Block scan program



Before using Index register, save OFFSET value in Index register (R device).

1) Set OFFSET variable value into R0
2) On Delay Timer is turned ON, Timer will be turned ON.
3) If it remains ON until assigned time at SETTING, OUTPUT will be turned ON.

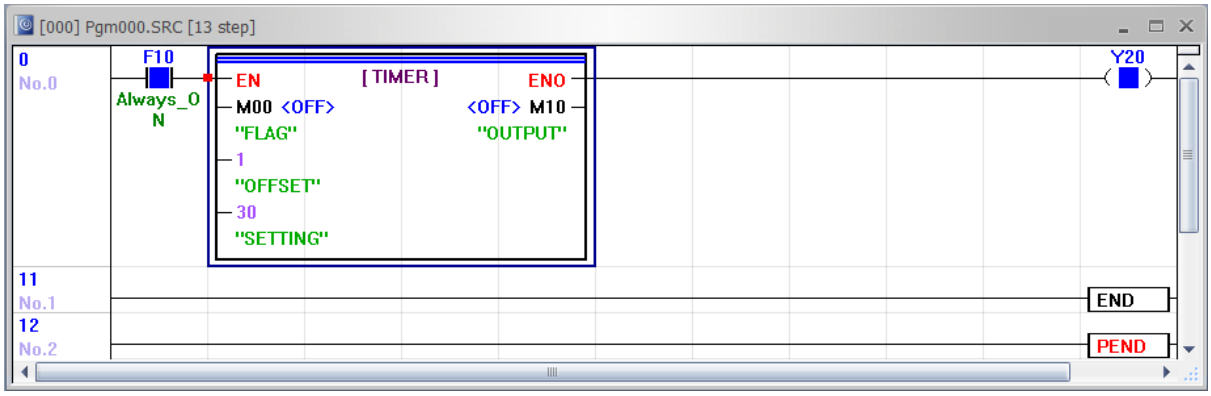
• Timer in Scan program



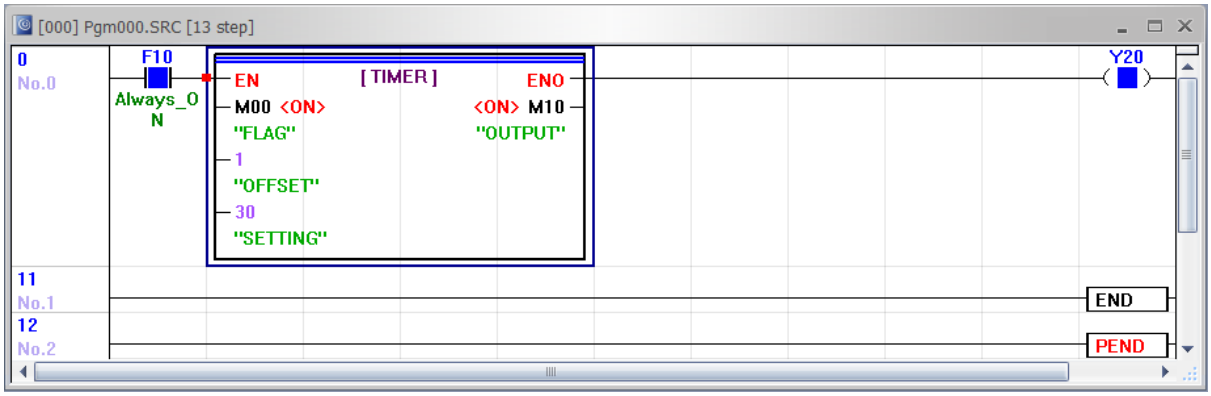
If you use Timer in Function Block, F10(Application Instruction) is recommended to check ON Delay or OFF Delay. For example, if M00 bit is remained ON for 3 seconds (in case of 100ms timer), M10 bit will be turned ON.

• Monitoring

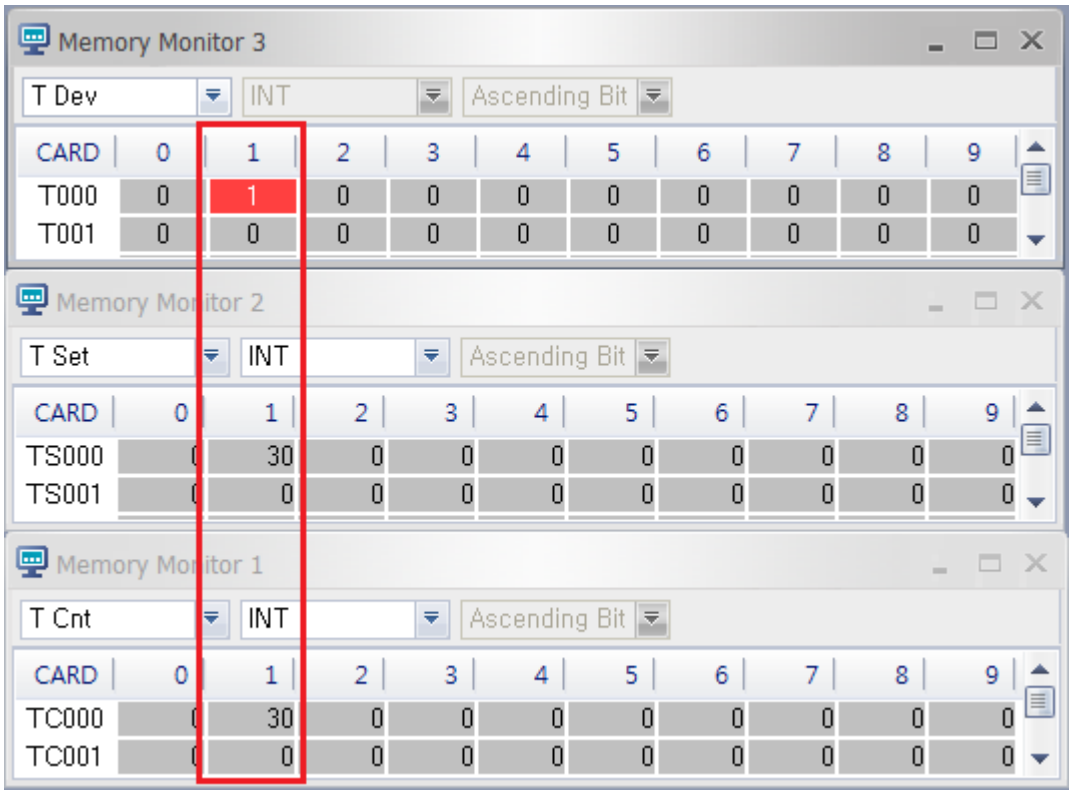
After a Function Block is downloaded to CPU and it is turned to RUN mode, the function block appears monitoring mode as below. Even though the function block is running, Timer will not work if M00 is OFF.



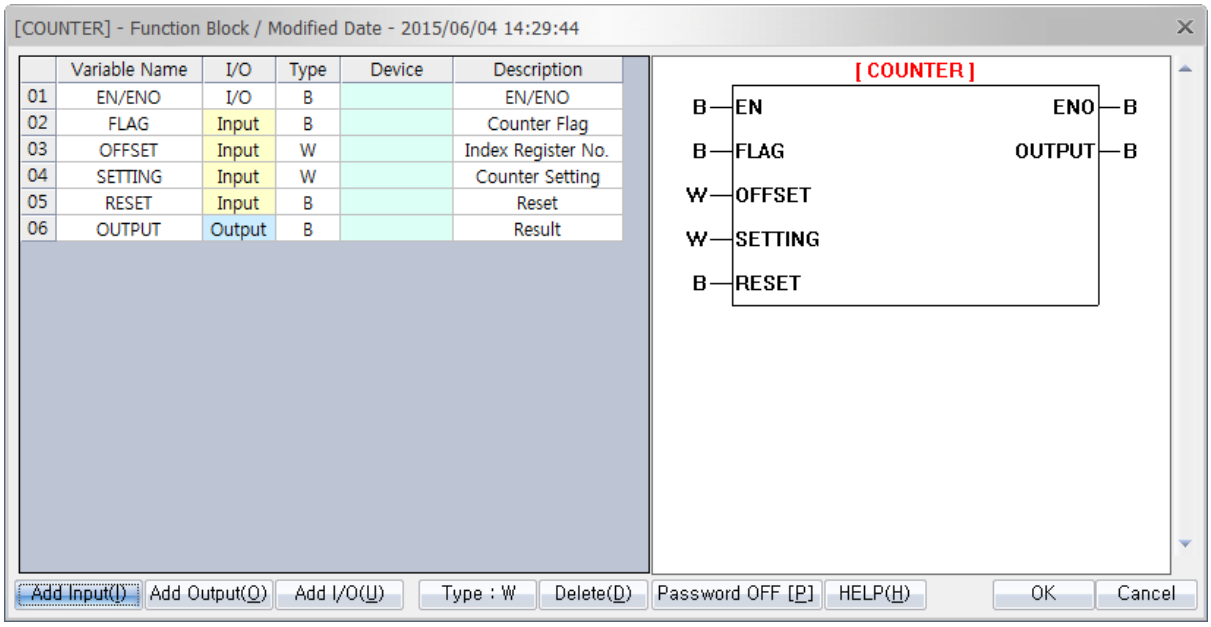
M00 is turned ON and after 3 seconds (in case of 100ms), OUTPUT(M10) will be turned ON as below.



The Timer device value is shown as below.


Memory Monitor 3
T Dev
INT
Ascending Bit
CARD 0 1 2 3 4 5 6 7 8 9
T000 0 1 0 0 0 0 0 0 0 0
T001 0 0 0 0 0 0 0 0 0 0
Memory Monitor 2
T Set
INT
Ascending Bit
CARD 0 1 2 3 4 5 6 7 8 9
TS000 0 30 0 0 0 0 0 0 0 0
TS001 0 0 0 0 0 0 0 0 0 0
Memory Monitor 1
T Cnt
INT
Ascending Bit
CARD 0 1 2 3 4 5 6 7 8 9
TC000 0 30 0 0 0 0 0 0 0 0
TC001 0 0 0 0 0 0 0 0 0 0

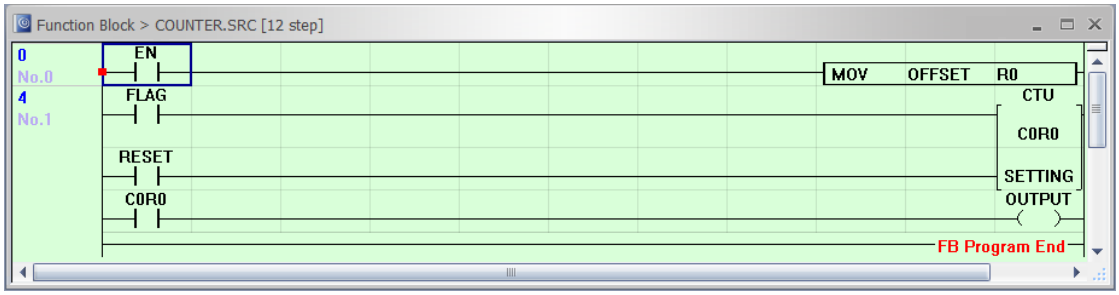
• CTU (UP Counter) Instruction : Variable configuration



Variable Name	I/O	Type	Device
FLAG	Input	Bit	Operating bit for UP Counter
OFFSET	Input	Word	Write Index register number (0~15)
SETTING	Input	Word	Write Counter set value (CS)
RESET	Input	Bit	Counter reset bit
OUTPUT	Output	Bit	It will be turned ON, if FLAG bit is turned ON and OFF as Setting counter.

-RESET : COUNTER is not cleared automatically. It must be cleared by RESET bit.

• CTU (UP Counter) Instruction : Function Block scan program



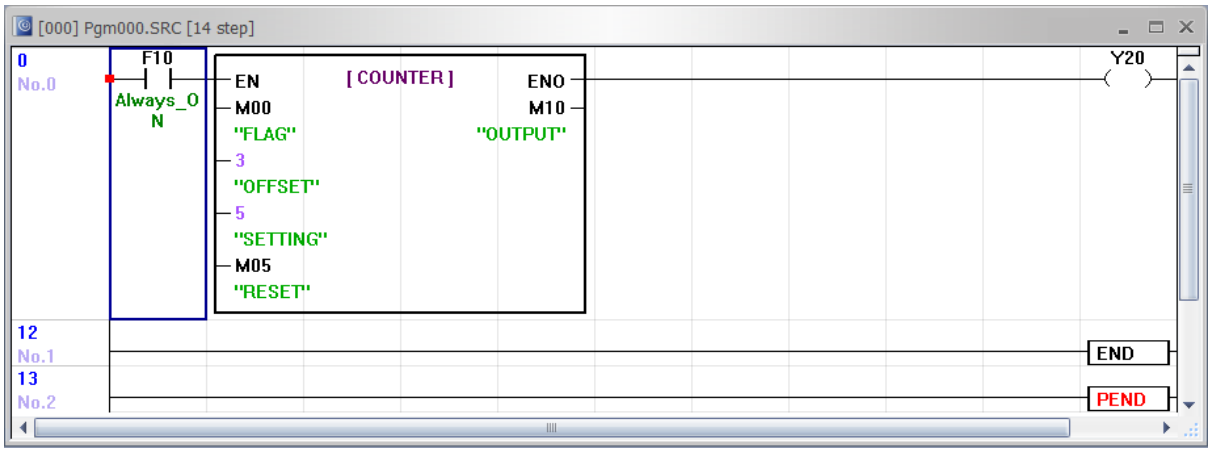
Before using Index register, save OFFSET value in Index register (R device).

1) Set OFFSET variable value into R0

2) UP Counter is turned ON, Counter will be increased. (If RESET bit is ON, counter will be cleared)

3) If it is turned On and Off as assigned counter at SETTING, OUTPUT will be turned ON.

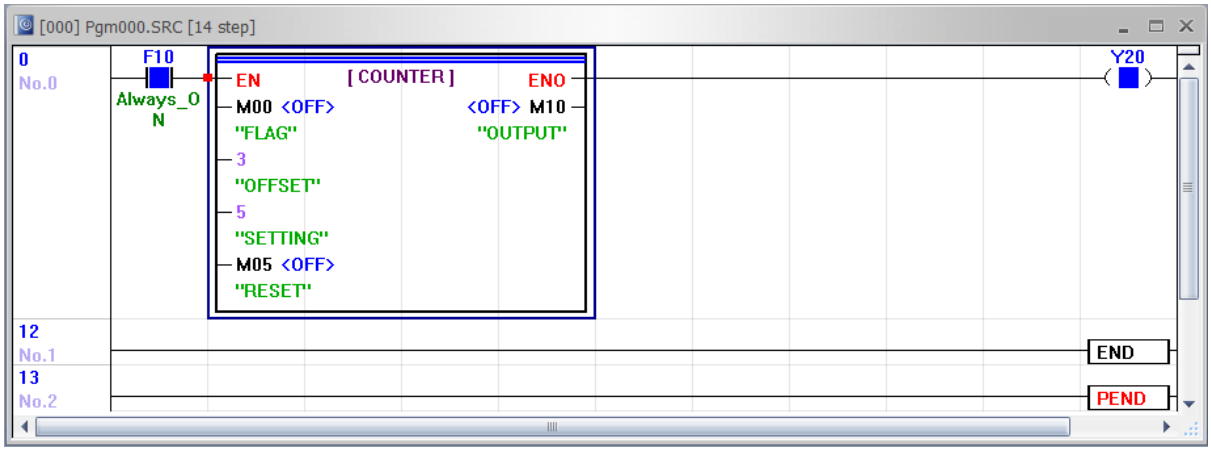
• Counter in Scan program



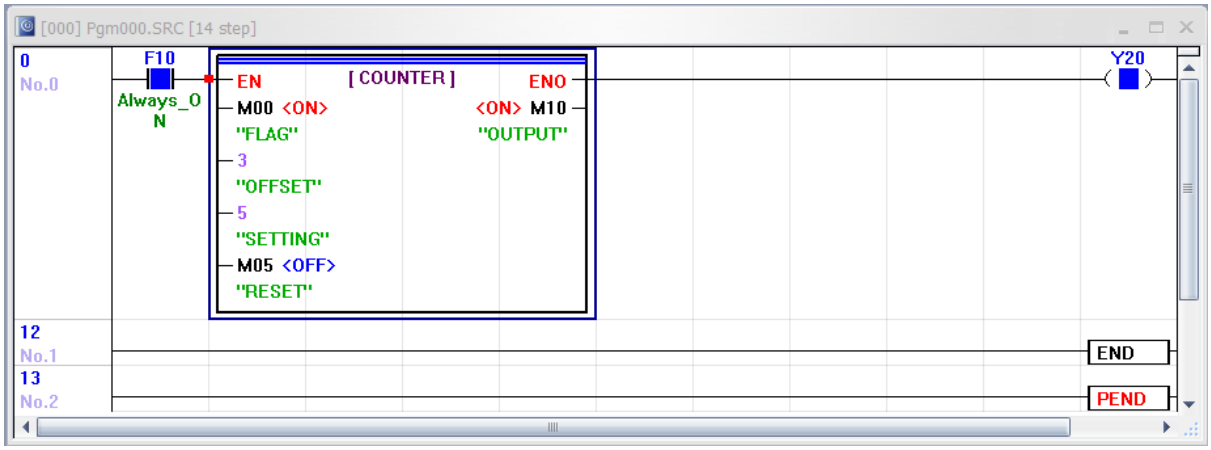
If you use Counter in Function Block, F10(Application Instruction) is recommended to check ON Delay or OFF Delay. For example, if M00 bit is turned On and Off 5times (5th ON time), M10 bit will be turned ON.

• Monitoring

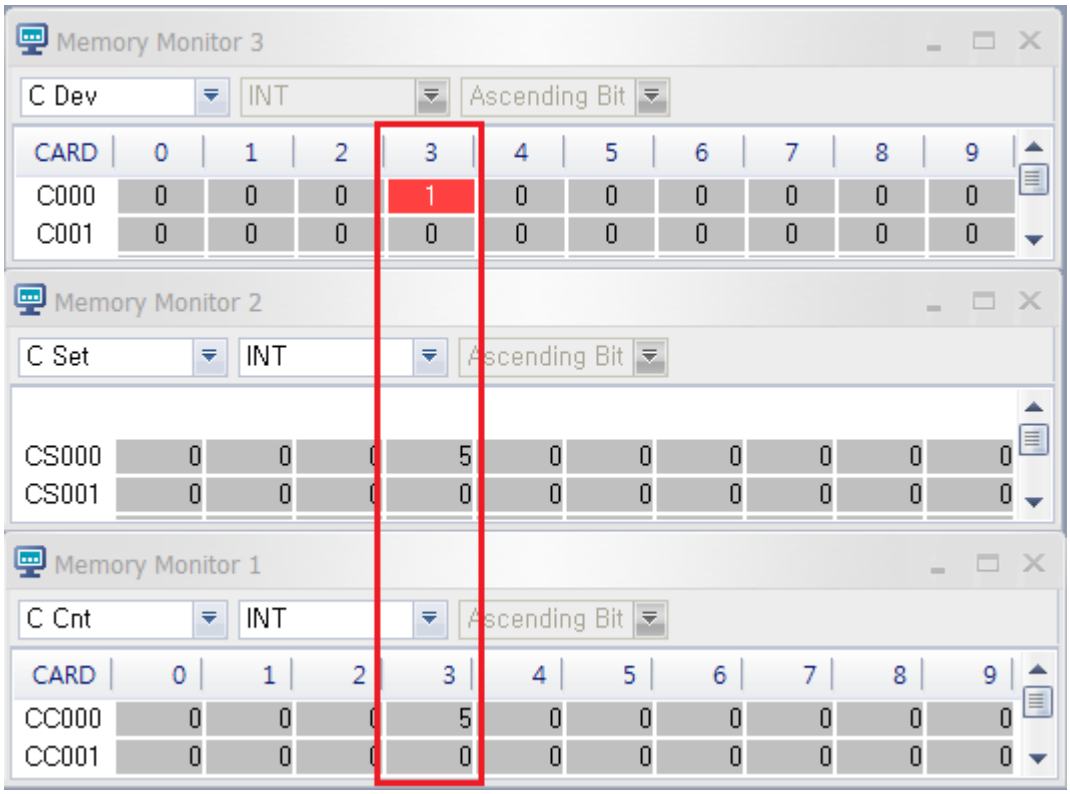
After a Function Block is downloaded to CPU and it is turned to RUN mode, the function block appears monitoring mode as below. Even though the function block is running, Counter will not work if M00 is OFF.



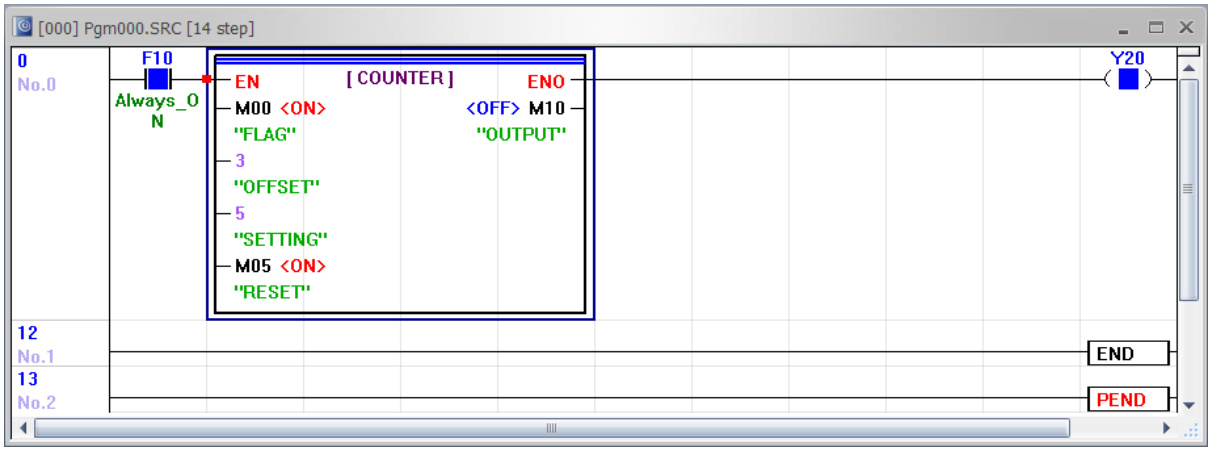
If M00 bit is turned On 5th time, OUTPUT (M10) will be turned ON.



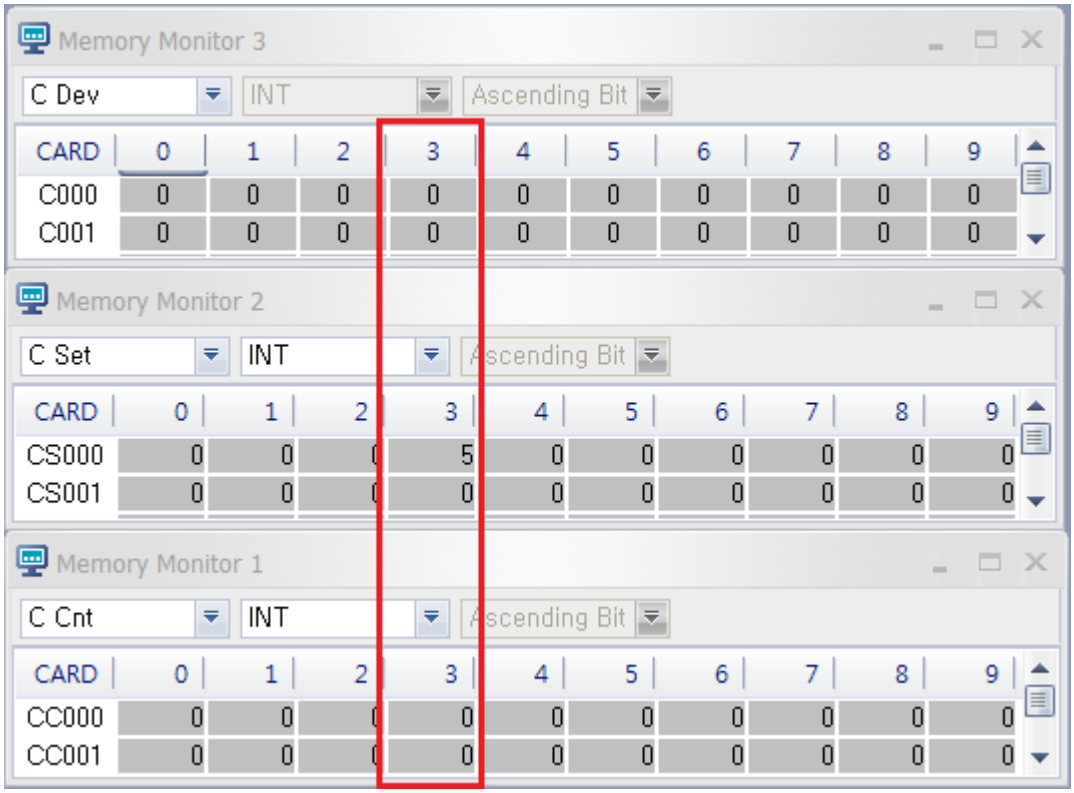
The Counter device value is shown as below.


Memory Monitor 3
C Dev
INT
Ascending Bit
CARD 0 1 2 3 4 5 6 7 8 9
C000 0 0 0 1 0 0 0 0 0 0
C001 0 0 0 0 0 0 0 0 0 0
Memory Monitor 2
C Set
INT
Ascending Bit
CS000 0 0 0 5 0 0 0 0 0 0
CS001 0 0 0 0 0 0 0 0 0 0
Memory Monitor 1
C Cnt
INT
Ascending Bit
CARD 0 1 2 3 4 5 6 7 8 9
CC000 0 0 0 5 0 0 0 0 0 0
CC001 0 0 0 0 0 0 0 0 0 0

If RESET bit (M05) is turned ON, the counter value is cleared.



After cleared, Counter device value is shown as below.


Memory Monitor 3
C Dev
INT
Ascending Bit
CARD 0 1 2 3 4 5 6 7 8 9
C000 0 0 0 0 0 0 0 0 0 0
C001 0 0 0 0 0 0 0 0 0 0
Memory Monitor 2
C Set
INT
Ascending Bit
CARD 0 1 2 3 4 5 6 7 8 9
CS000 0 0 0 5 0 0 0 0 0 0
CS001 0 0 0 0 0 0 0 0 0 0
Memory Monitor 1
C Cnt
INT
Ascending Bit
CARD 0 1 2 3 4 5 6 7 8 9
CC000 0 0 0 0 0 0 0 0 0 0
CC001 0 0 0 0 0 0 0 0 0 0

2. Create Function Block

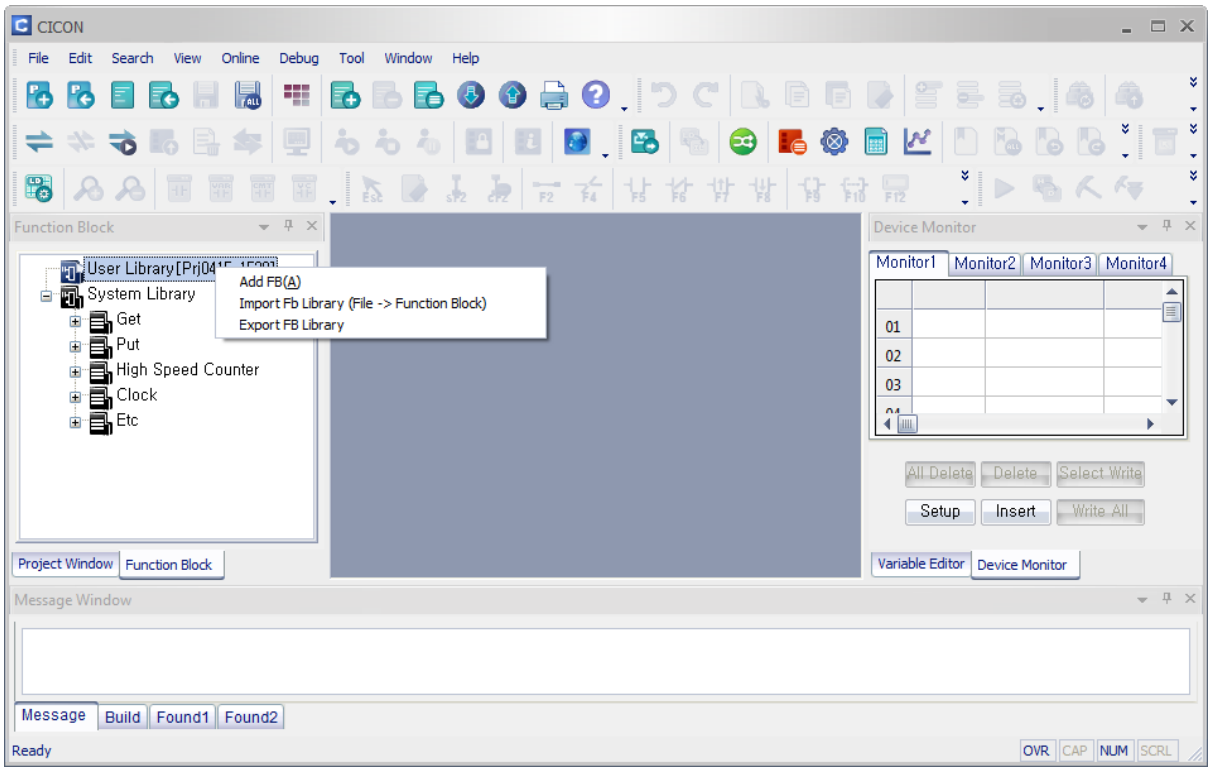
2.1. Add new Function Block

Create new project.

If you want to use more than one Function Block on the same Rung, select FB Extension at

the project Option and click OK.

Click Function Block Window tab. Right-click the User Library and choose FB(A)



• User Library : FB that you create is saved in this folder. You can edit, import and export FB.

User Library is belong to project property so if you create new project or open other project, FB will be removed. If you want to use FB that you created at the other project, you can export FB to file or add it to User System Library.

If FB in User Library is not used in Scan program, it will be removed when you download project file to PLC. Therefore, export FB to file before downloading project file to PLC. You can also find out deleted FB after uploading PLC to CICON. Click File and choose Import FB backup file.

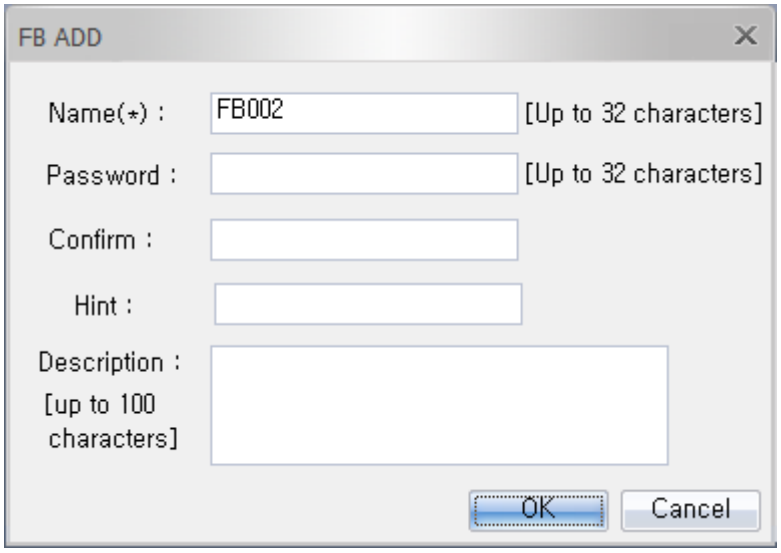
• System Library : This is fixed FB that Cimon provides. You are not able to edit FB in the System Library.

• User System Library : If you export FB in User Library to File, you can save it in file or in User System Library. You are not able to edit FB in this folder but you can only delete FB.

Type FB Name and click OK.

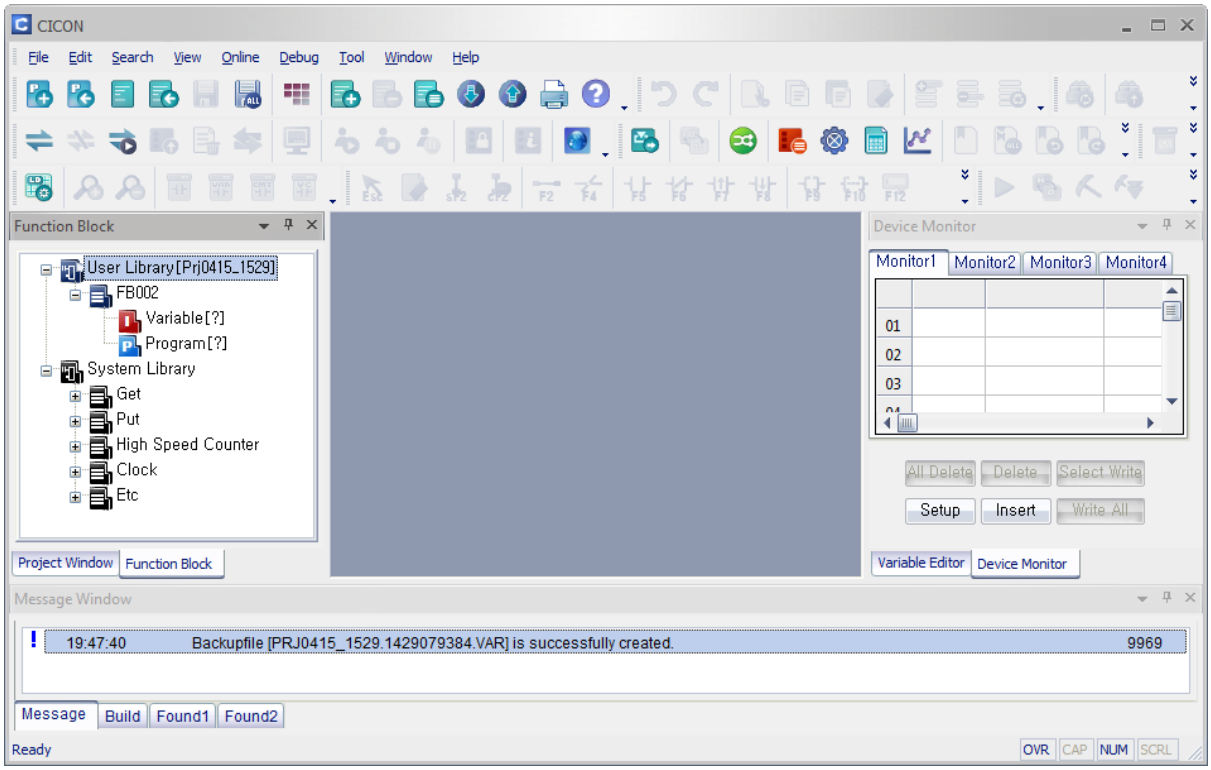
If you want to lock the FB, type password and confirm it.

Otherwise, just leave a blank at Password.



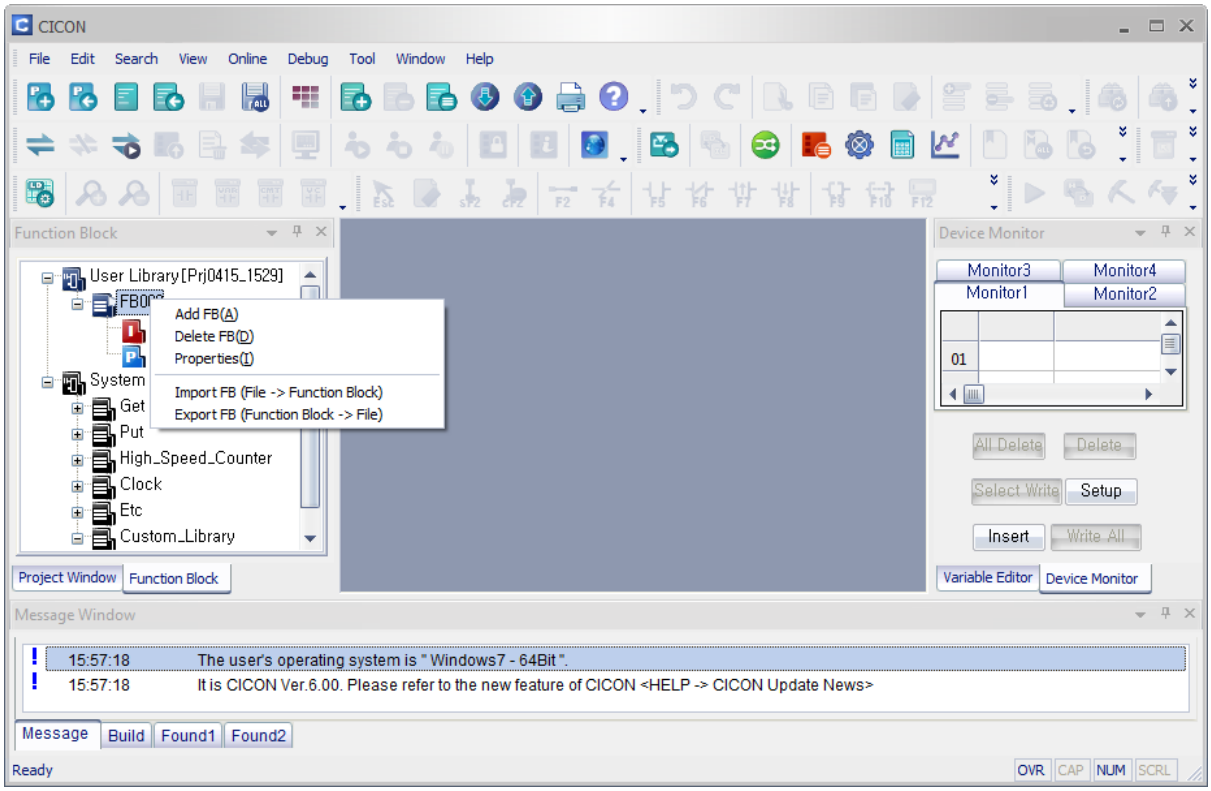
Variable[?] and program[?] are created under FB002.

Question mark [?] will disappear when you set Variable and create scan program.



2.2. Export Function Block

Right-click the FB and choose Export FB (Function Block→File).



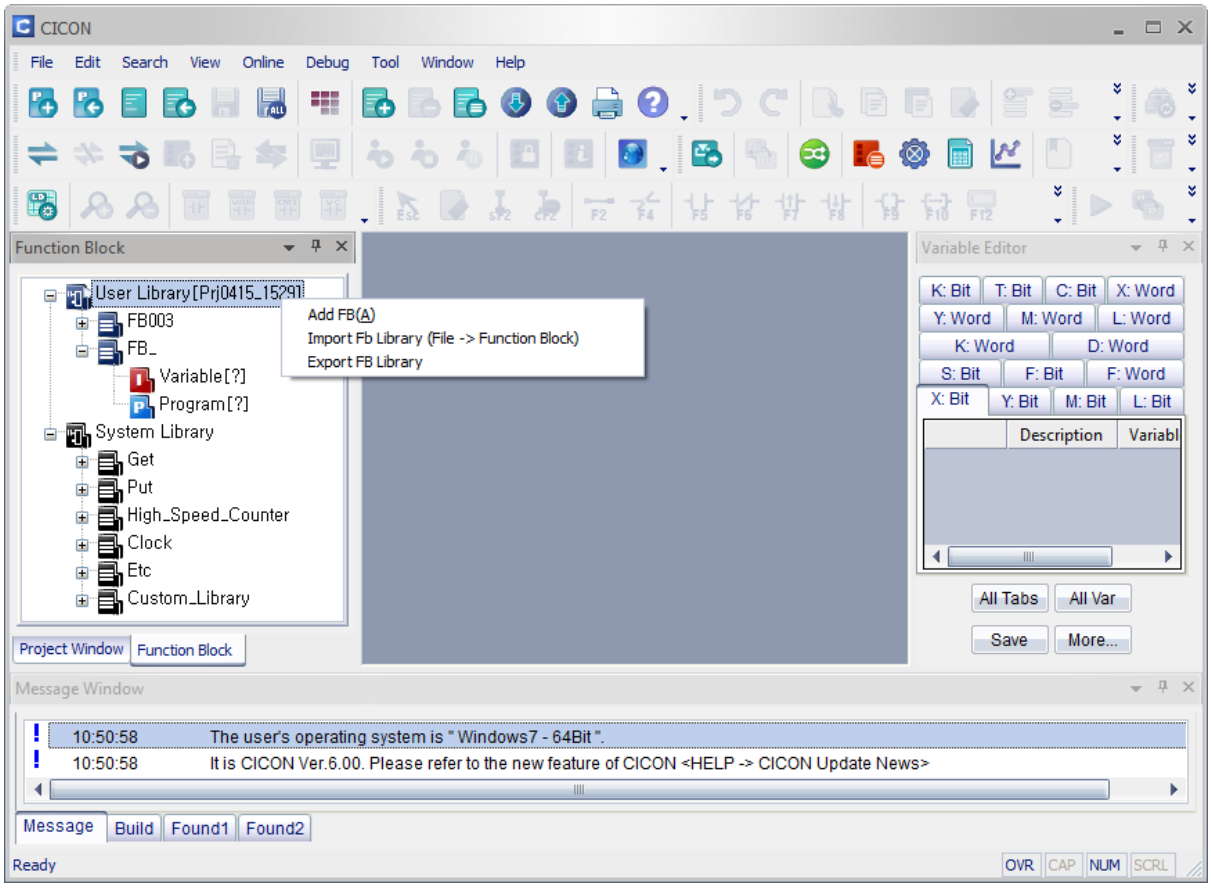
• If you click Yes, FB will be saved in User System Library. User System Library is belong to CICON folder so even if you open a project or create new project, you can always use FB in User System Library.

Notice : You are not able to edit FB in User System Library.

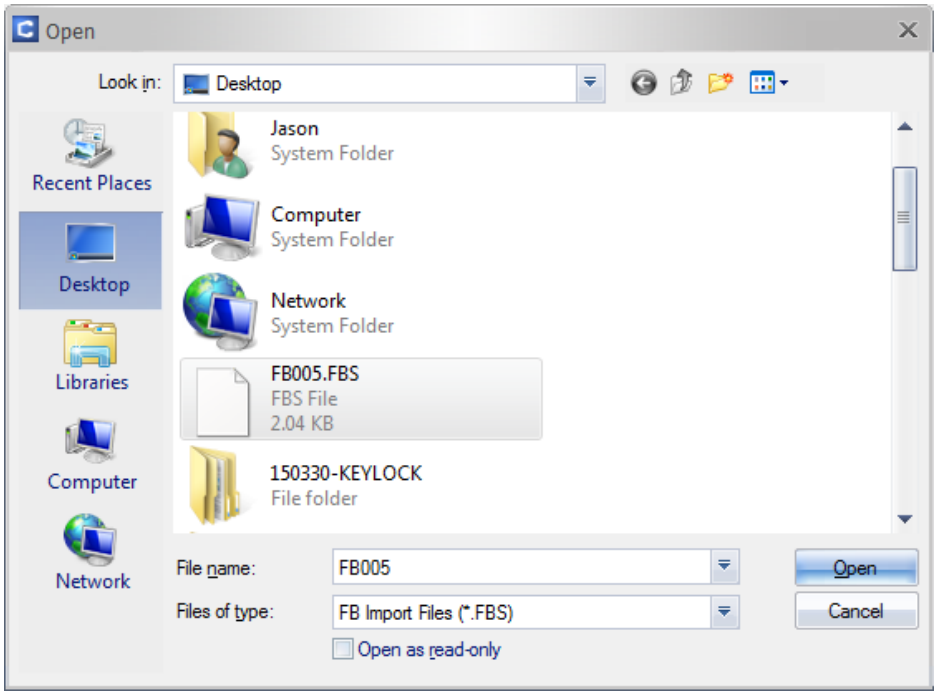
• If you click No, FB will be saved to folder in your PC. You can also import this FB file to other project file. You can edit FB in User Library.

2.3. Import Function Block

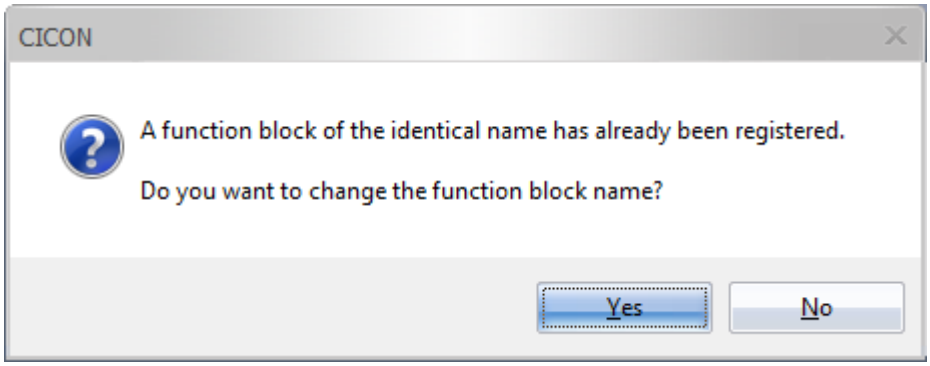
Right-click User Library and choose Import FB Library (File → Function Block).



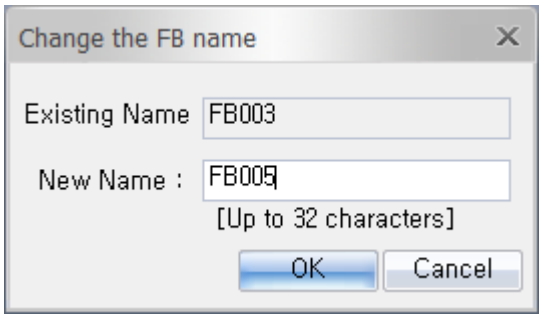
Choose the FB file(*.FBS) and click Open.



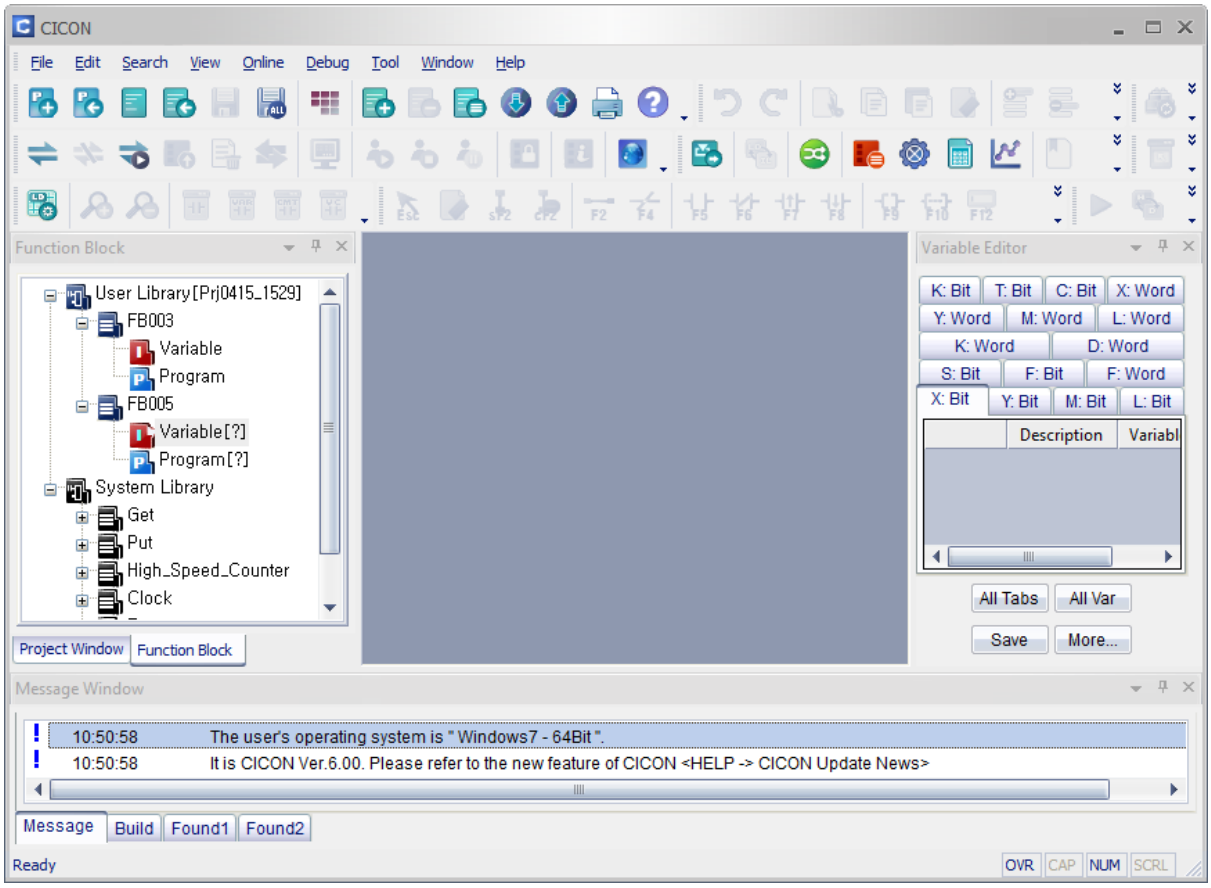
If the same FB name exists in Library, click Yes to change the name.


CICON
A function block of the identical name has already been registered.
Do you want to change the function block name?
Yes
No

Type the new name and click OK.



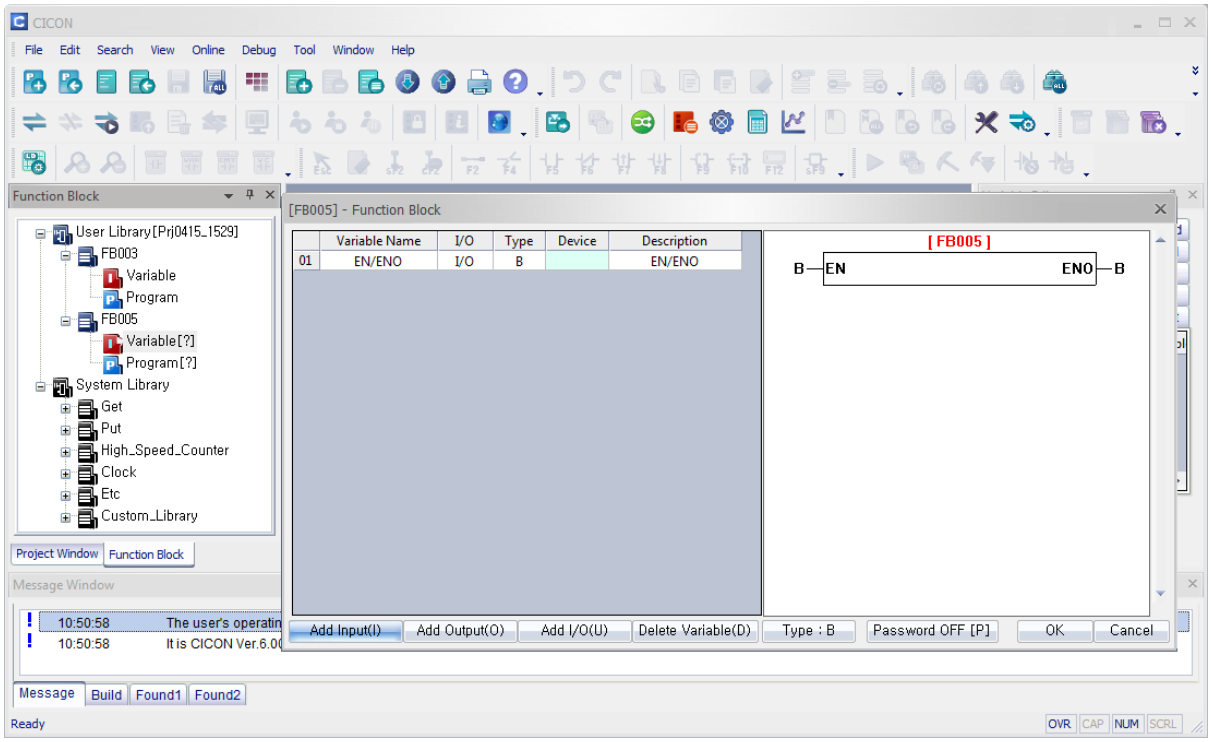
Function Block (FB005) is just added in User Library.



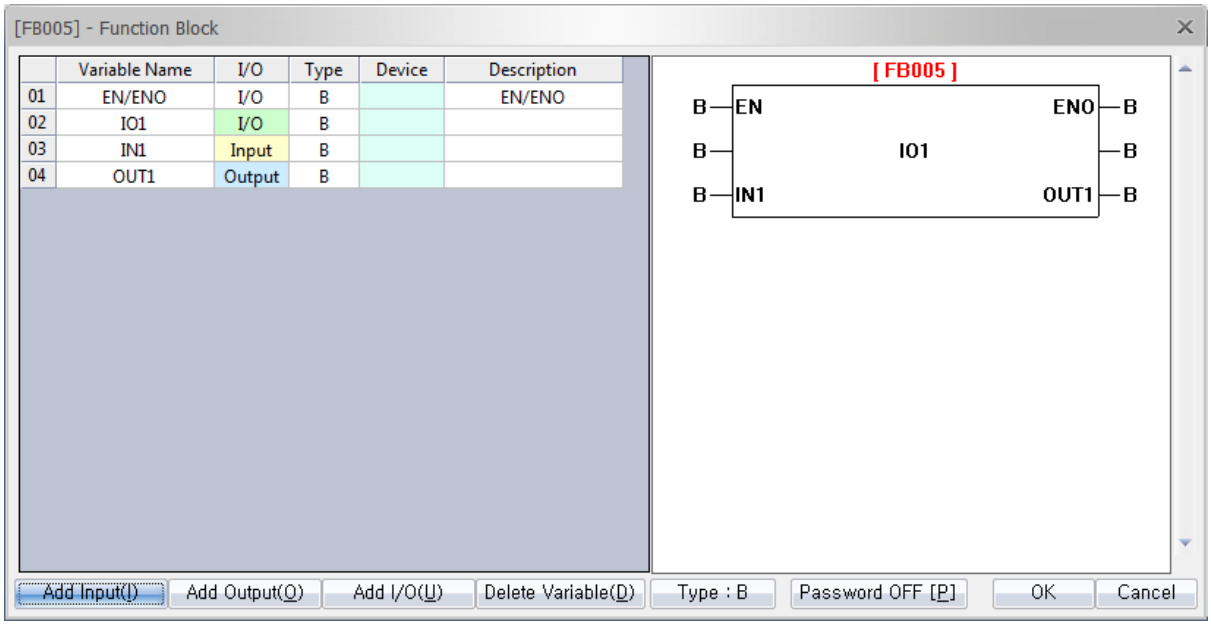
3. Function Block Variable

Double-click Variable.

FB Variable configuration pops up.



▶The variable in FB folder is local variable that only works in current FB folder.


[FB005] - Function Block
Variable Name I/O Type Device Description
01 EN/ENO I/O B EN/ENO
02 IO1 I/O B
03 IN1 Input B
04 OUT1 Output B
[FB005]
B EN ENO B
B IO1 B
B IN1 OUT1 B
Add Input(I) Add Output(O) Add I/O(U) Delete Variable(D) Type : B Password OFF [P] OK Cancel

• Variable Name : The same name with FB or Device address cannot be used. The maximum 16 characters are available.

• I/O : From I/O pull-down menu, choose Input, Output or Input/Output.

- Input : Read integer value or device address
- Output : Write device address only (Integer value is not possible)
- I/O(Input and Output) : You can use one device address for both input or output.

(Integer value is not possible)

▶ You cannot use below device type for Output and I/O.

X / F/ T / TC / TS / C / CC / CS

• Type : From Type pull-down menu, choose Bit, Word, Double Word or Float.

- B (Bit) : 0 or 1
- W (Word) : 2Byte (Unsigned: 0~65,535 / Signed: -32,768~32,767)
- DW (Double Word) : 4Byte (Unsigned: 0~4,294,967,295 / Signed: -2,147,483,648~2,147,483,647)
- F (Float) : 4Byte (3..4E +/- 38 : 7Digits)

• Device : You cannot set up device address here. When FB is used in scan program(Ladder Logic), you can set device address for each input and output.

• Description : Maximum 16characters are available.

Add Input : Default Variable name is IN + number that is persistent.

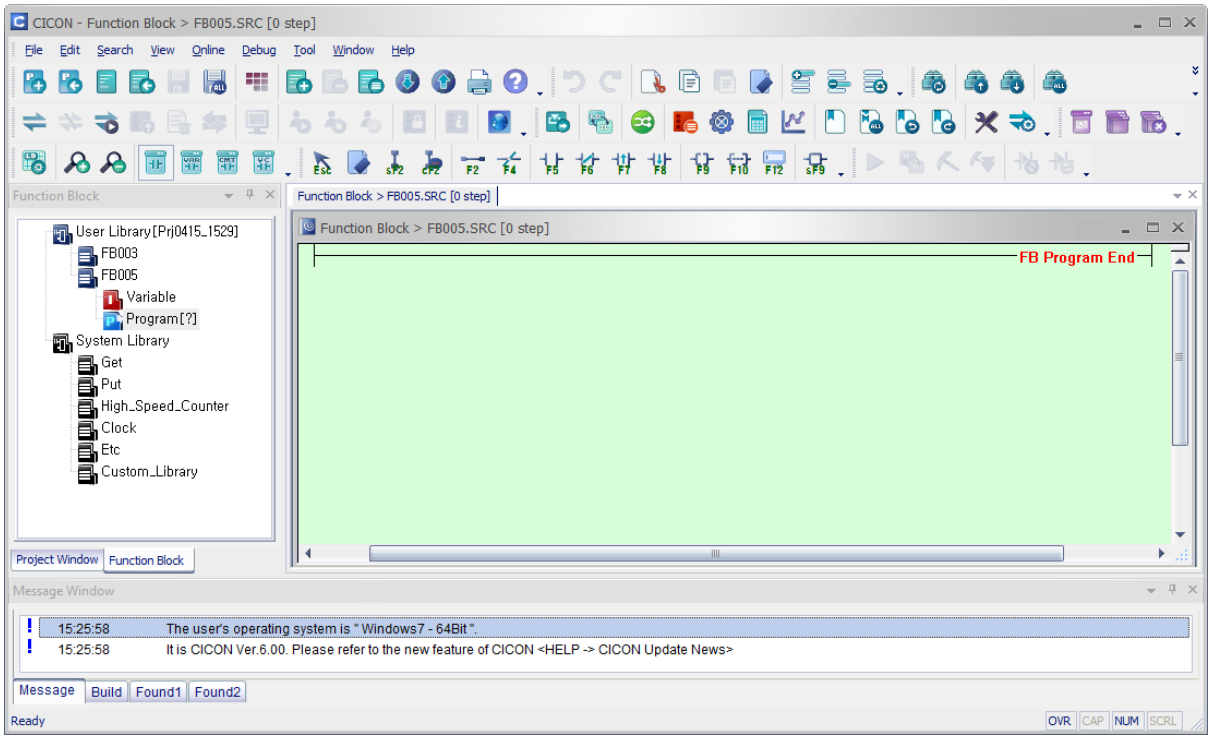
4. Function Block Program

4.1. Develop program(Ladder Logic)

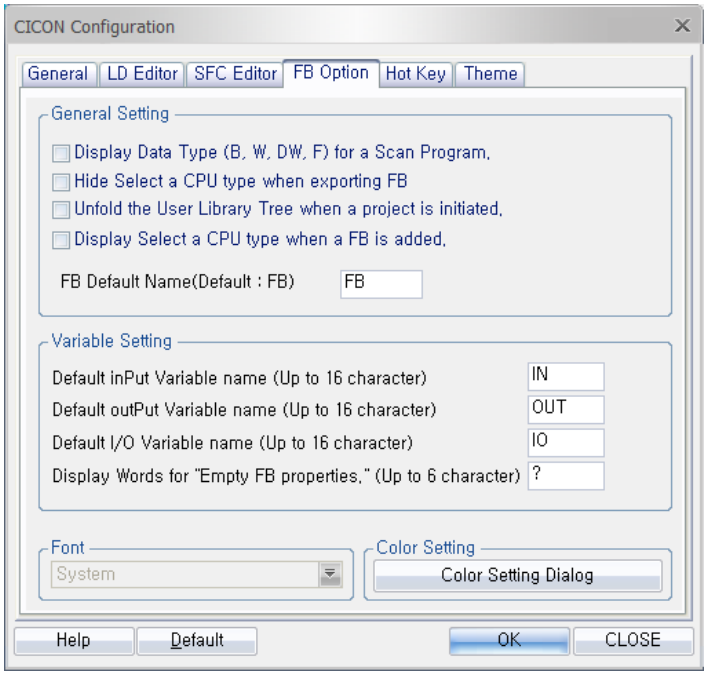
Double click Program.

Function Block scan program is very similar with main scan program.

Instead of END / PEND instruction, FB Program End will be used in FB scan program.

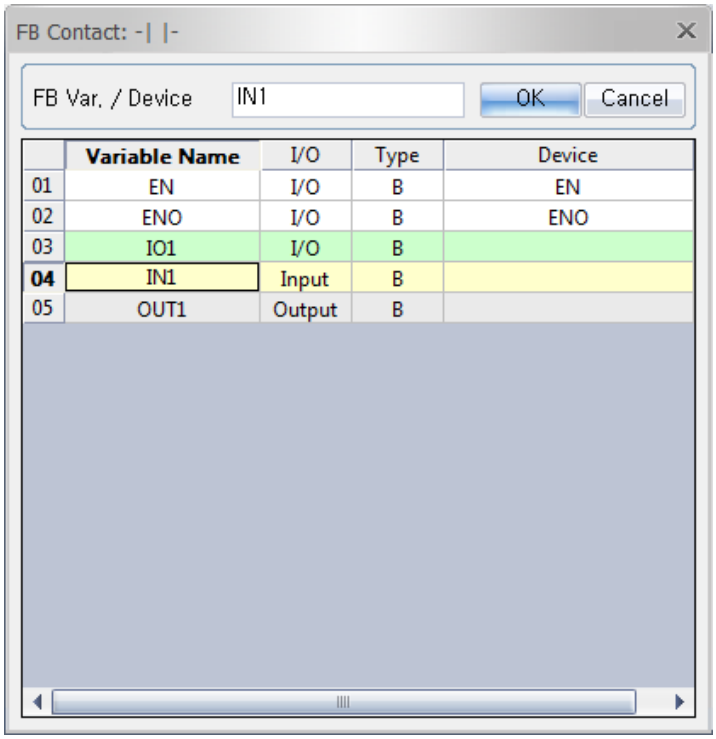


To change the option of FB scan editor, click Tool and choose CICON Options and click FB Option tab.

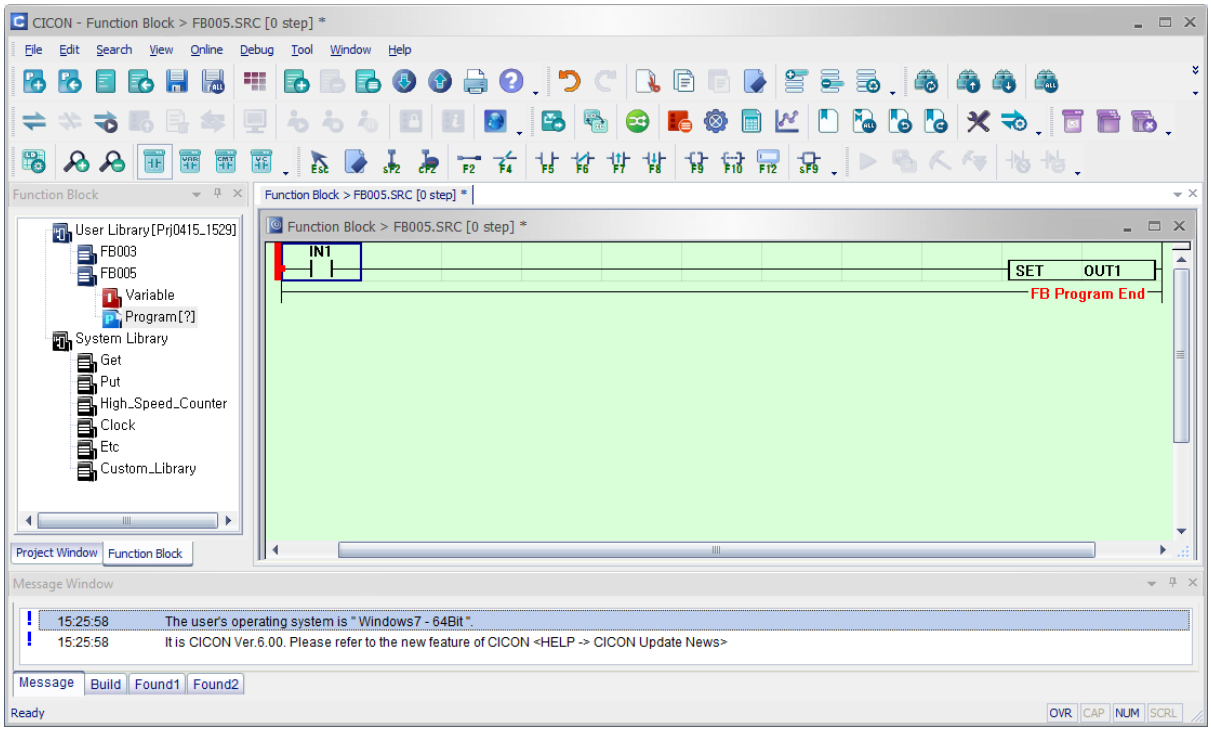


If you enter an instruction on a Rung, FB Variable pops up to select Variable.

Type Variable or Device name or Double-click Variable name or Device and click OK.



When a Rung is completed, red vertical line appears.



Example) If IN1 is ON, OUT1 is ON.

If you save the program, red mark will disappear.

5. Enter FB in a main scan program(Ladder Logic)

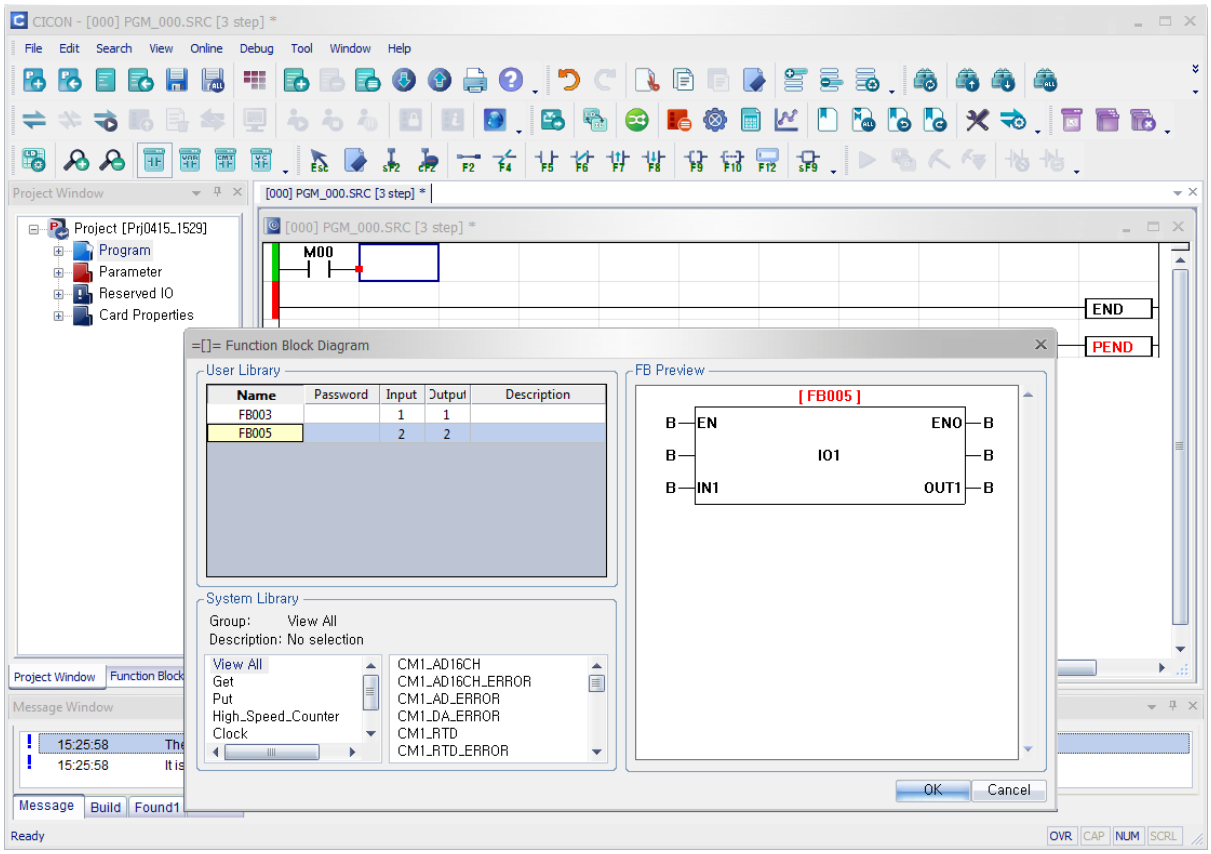
5.1. Enter FB in a Ladder Logic

To enter FB in a Ladder Logic, click Project Window and add scan program.

Click the desired location on the Rung where you want to enter FB and press Shift+F9 or click

.

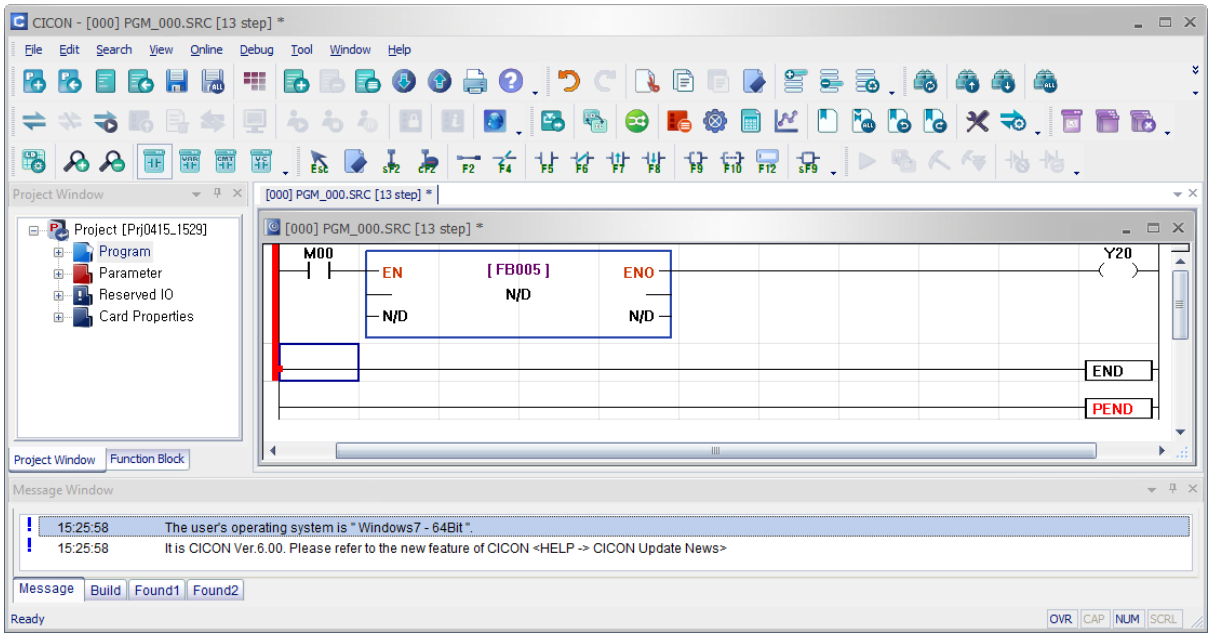
Function Block Diagram appears as below.

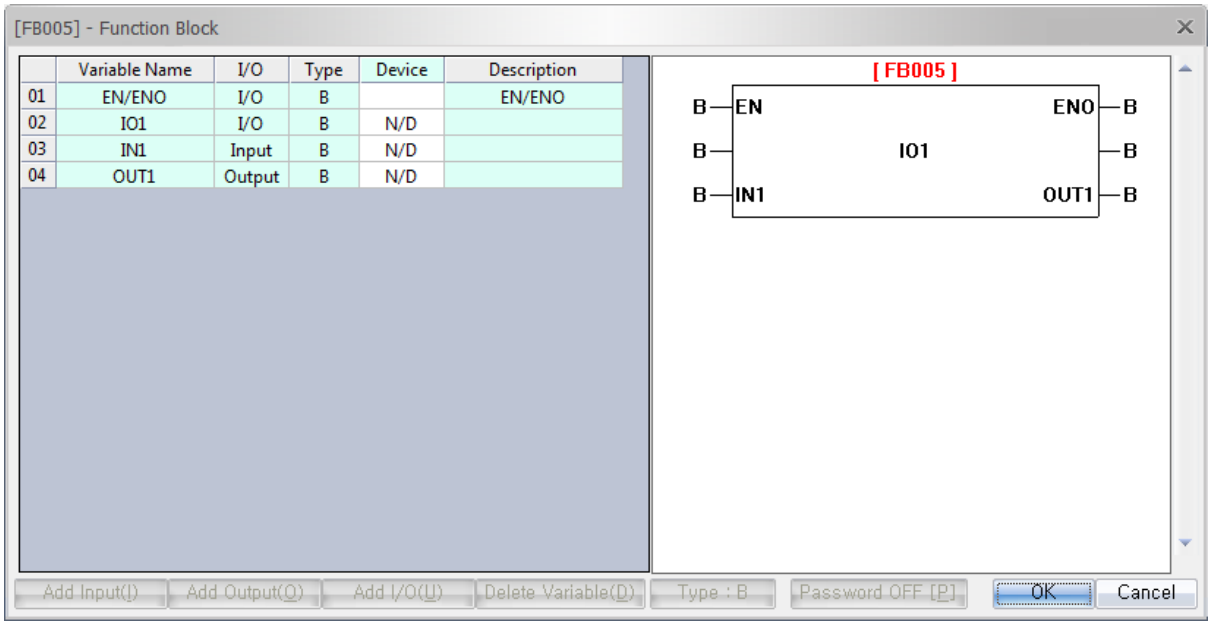


Choose FB in User Library or System Library and click OK.

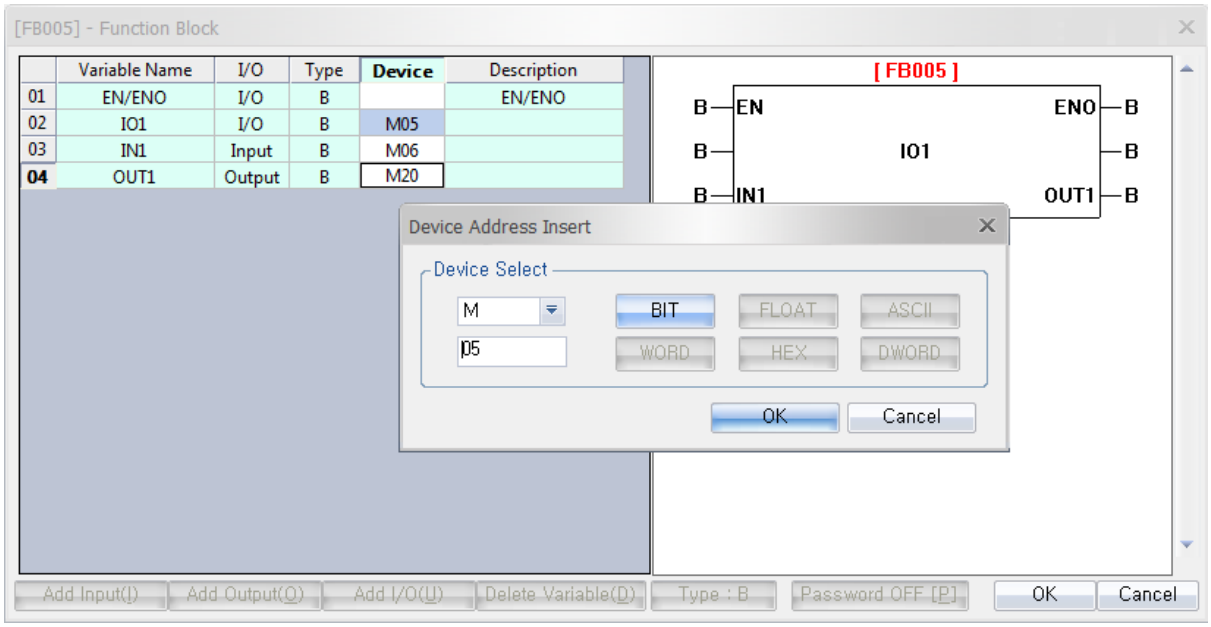
If you click the FB name, detailed variable appears on FB Review.

To set device address for FB variable, double-click FB.

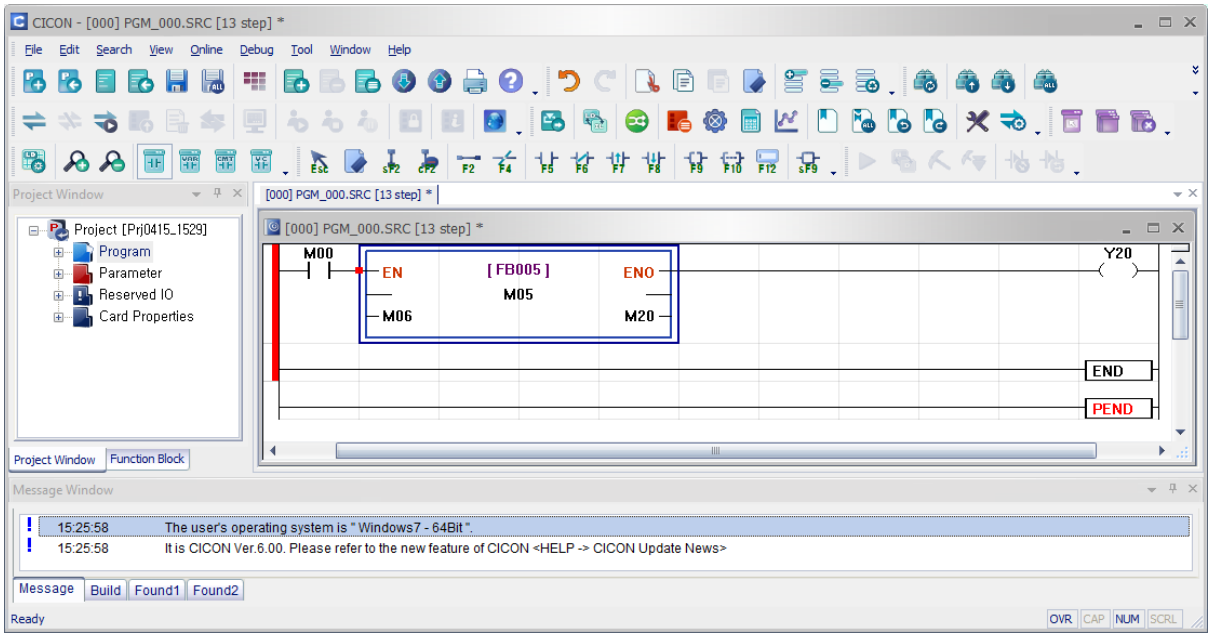




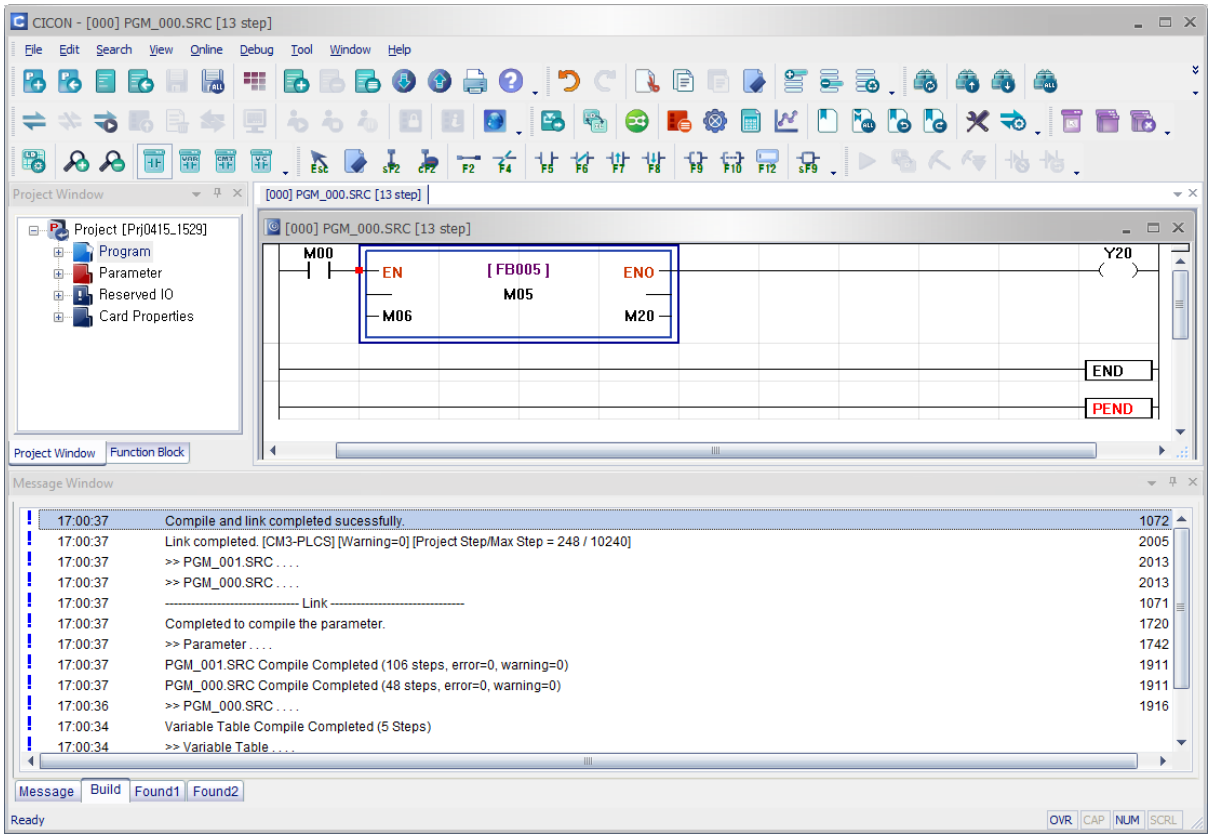
Click N/D and type device address or right-click N/D and choose the device and address.



If Scan program is complete, click File and choose Save Program.



Click Tool and Choose Compile All+Link.



Check Message Window in case of error.